

(12) **United States Patent**
Zhan et al.

(10) **Patent No.:** **US 10,663,126 B2**
(45) **Date of Patent:** **May 26, 2020**

(54) **ILLUMINATION DEVICE**

(71) Applicant: **OPPLE LIGHTING CO., LTD.**,
Shanghai (CN)

(72) Inventors: **Gongpu Zhan**, Shanghai (CN); **Song Yin**, Shanghai (CN); **Ming Chen**,
Shanghai (CN)

(73) Assignee: **Opple Lighting Co., Ltd.**, Shanghai
(CN)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/379,590**

(22) Filed: **Apr. 9, 2019**

(65) **Prior Publication Data**
US 2019/0234569 A1 Aug. 1, 2019

Related U.S. Application Data

(63) Continuation of application No.
PCT/CN2017/105744, filed on Oct. 11, 2017.

(30) **Foreign Application Priority Data**

Oct. 17, 2016 (CN) 2016 1 0903815
Oct. 17, 2016 (CN) 2016 2 1128845 U

(51) **Int. Cl.**
F21V 13/04 (2006.01)
F21V 21/04 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC . **F21S 8/04** (2013.01); **F21S 8/00** (2013.01);
F21V 5/04 (2013.01); **F21V 7/0016** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC F21V 5/04; F21V 7/0016; F21V 13/04;
F21V 21/04; F21V 23/003; F21S 8/04;
F21S 8/00
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,738,436 A * 4/1998 Cummings F21S 8/026
362/294
5,749,646 A * 5/1998 Brittell F21S 10/02
362/231

(Continued)

FOREIGN PATENT DOCUMENTS

CN 101581437 A 11/2009
CN 201935108 U 8/2011
(Continued)

OTHER PUBLICATIONS

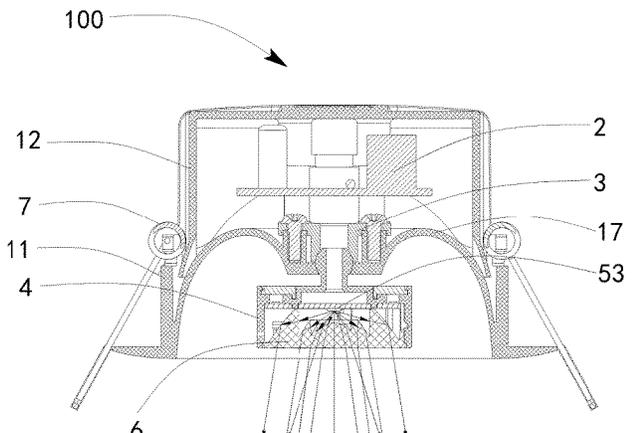
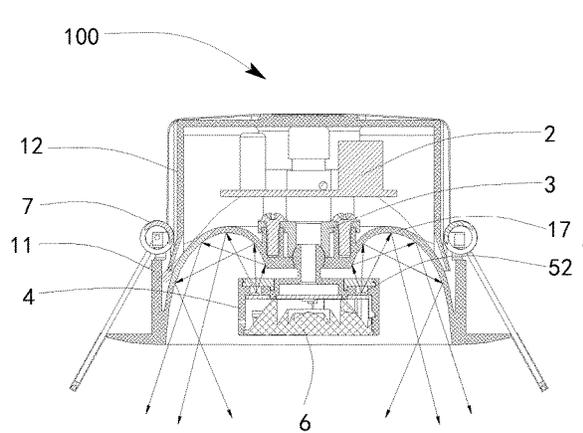
International Search Report (including English translation) and
Written Opinion issued in PCT/CN2017/105744, dated Dec. 22,
2017, 12 pages.

Primary Examiner — Arman B Fallahkhair
(74) *Attorney, Agent, or Firm* — Arch & Lake LLP

(57) **ABSTRACT**

The present disclosure discloses an illumination device,
including: a first lamp body; a driving power supply com-
ponent received in the first lamp body; a second lamp body
connected with the first lamp body; and a light source
component received in the second lamp body; the light
source component includes a light source substrate, a plu-
rality of first light-emitting units and a plurality of second
light-emitting units disposed on two surfaces of the light
source substrate respectively; an interior of the first lamp
body is provided with a reflector configured to reflect light
emitted from the plurality of first light-emitting units; an
interior of the second lamp body is provided with a lens
pressing against the light source component and configured
to perform a light condensation and a light collimation to
light emitted from the plurality of second light-emitting.

16 Claims, 7 Drawing Sheets



- | | | | | |
|------|--------------------|-----------|---------------------------------------|----------------------|
| (51) | Int. Cl. | | 8,894,240 B2 * 11/2014 Yoo | F21V 7/10
362/256 |
| | <i>F21S 8/04</i> | (2006.01) | | |
| | <i>F21V 23/00</i> | (2015.01) | 9,109,783 B1 * 8/2015 Davis | F21S 8/02 |
| | <i>F21V 5/04</i> | (2006.01) | 9,784,434 B2 * 10/2017 Watanabe | F21V 7/06 |
| | <i>F21V 7/00</i> | (2006.01) | 9,857,069 B2 * 1/2018 Kim | F21S 8/063 |
| | <i>F21S 8/00</i> | (2006.01) | 2007/0109775 A1 5/2007 Chen | |
| | <i>F21Y 115/10</i> | (2016.01) | 2019/0234577 A1 * 8/2019 Zhan | F21S 8/04 |

- (52) **U.S. Cl.**
 CPC *F21V 13/04* (2013.01); *F21V 21/04*
 (2013.01); *F21V 23/003* (2013.01); *F21Y*
2115/10 (2016.08)

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,158,019 B2 * 1/2007 Smith B60Q 1/2607
 340/467
 7,431,486 B2 * 10/2008 Bloemen B60Q 1/0052
 362/540

FOREIGN PATENT DOCUMENTS

CN 202001903 U 10/2011
 CN 102269355 A 12/2011
 CN 102954368 A 3/2013
 CN 203810146 U 9/2014
 CN 205351023 U * 6/2016
 CN 106322244 A 1/2017
 CN 206398473 U 8/2017
 EP 3521688 A1 * 8/2019

* cited by examiner

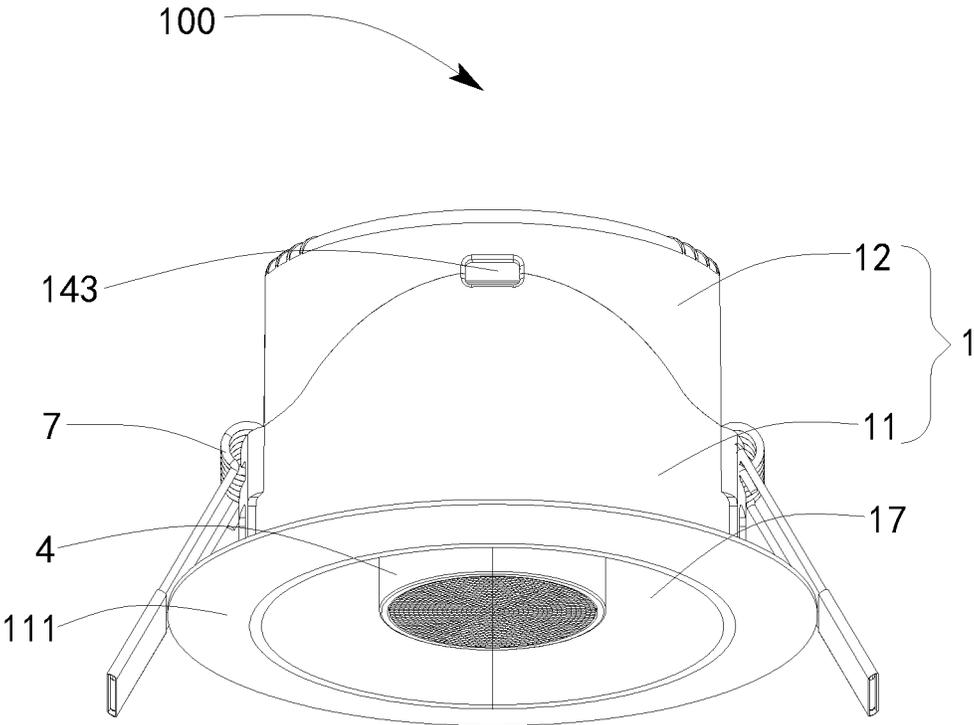


FIG. 1

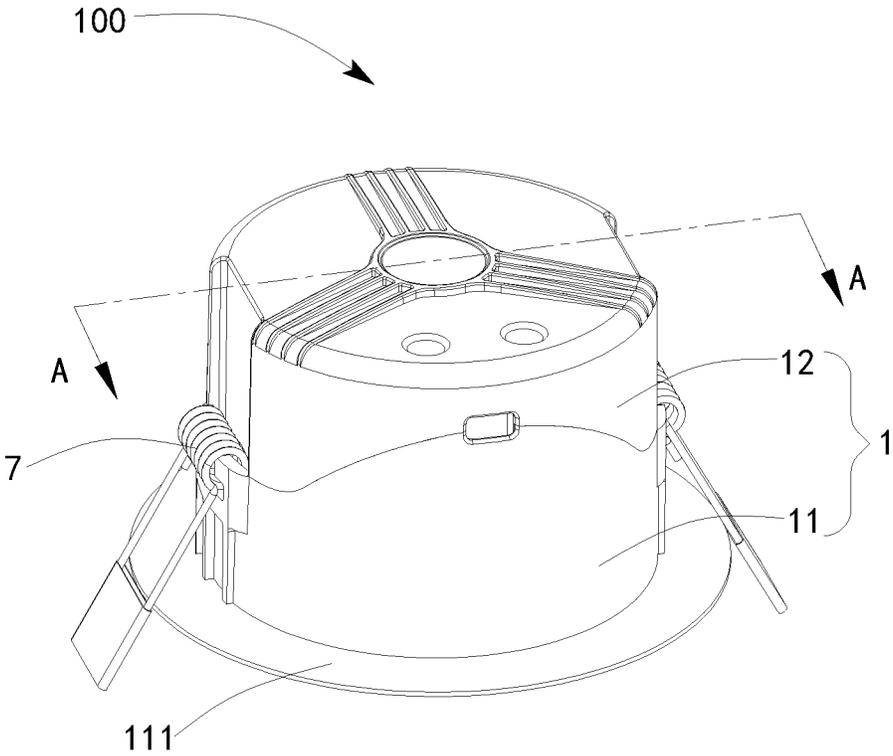


FIG. 2

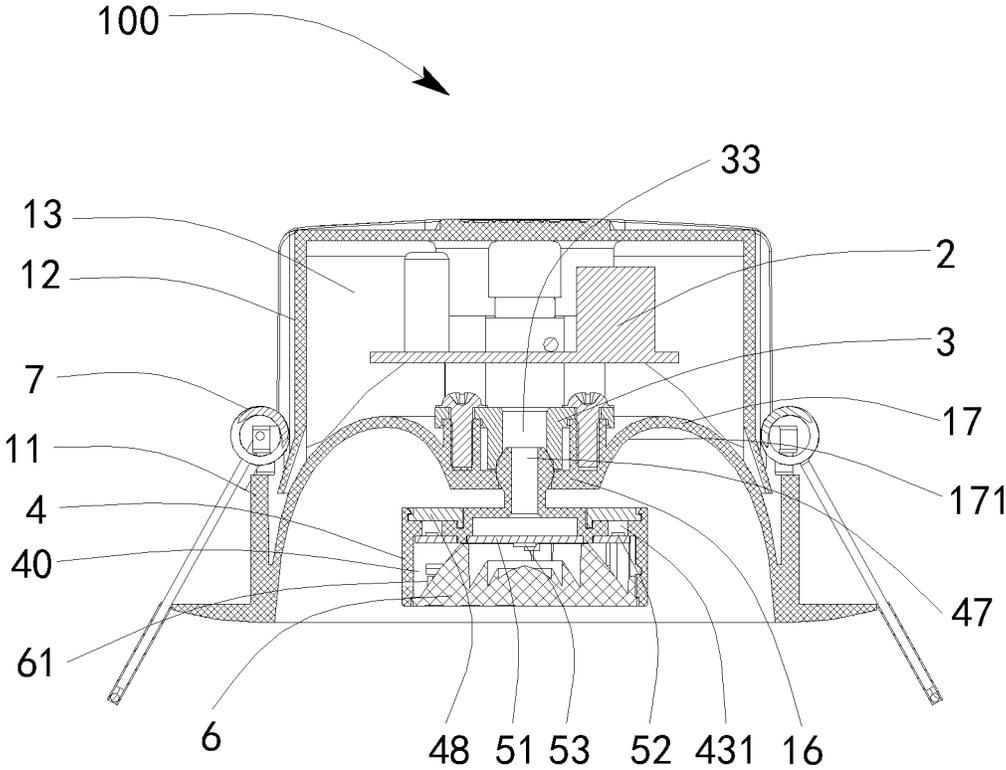


FIG. 3

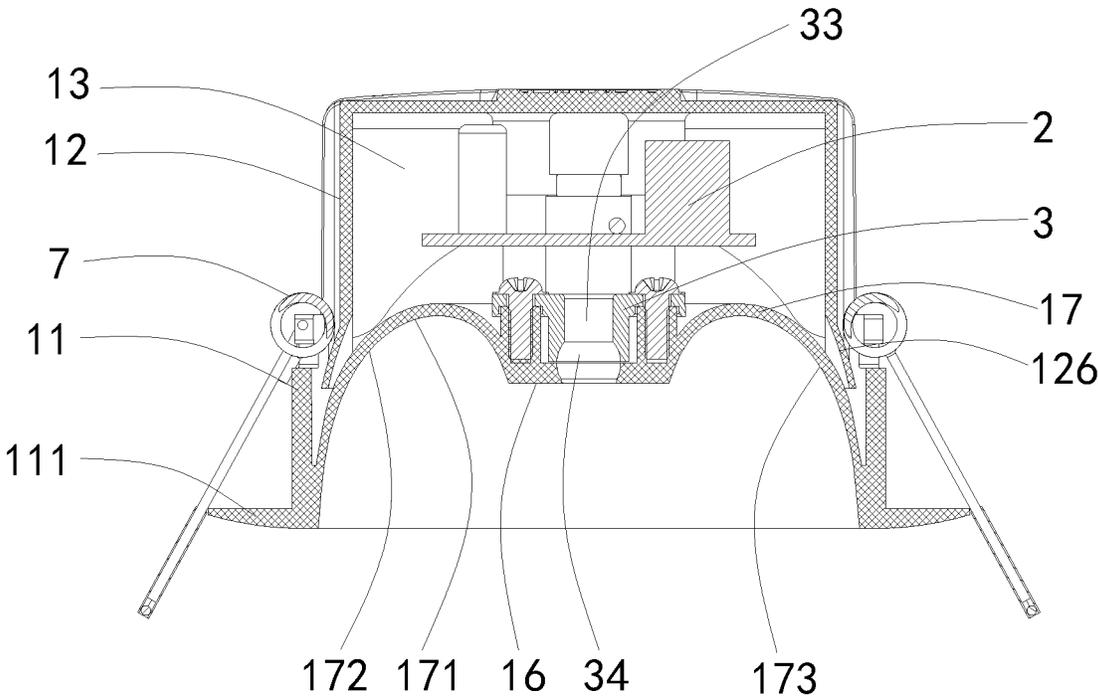


FIG. 4

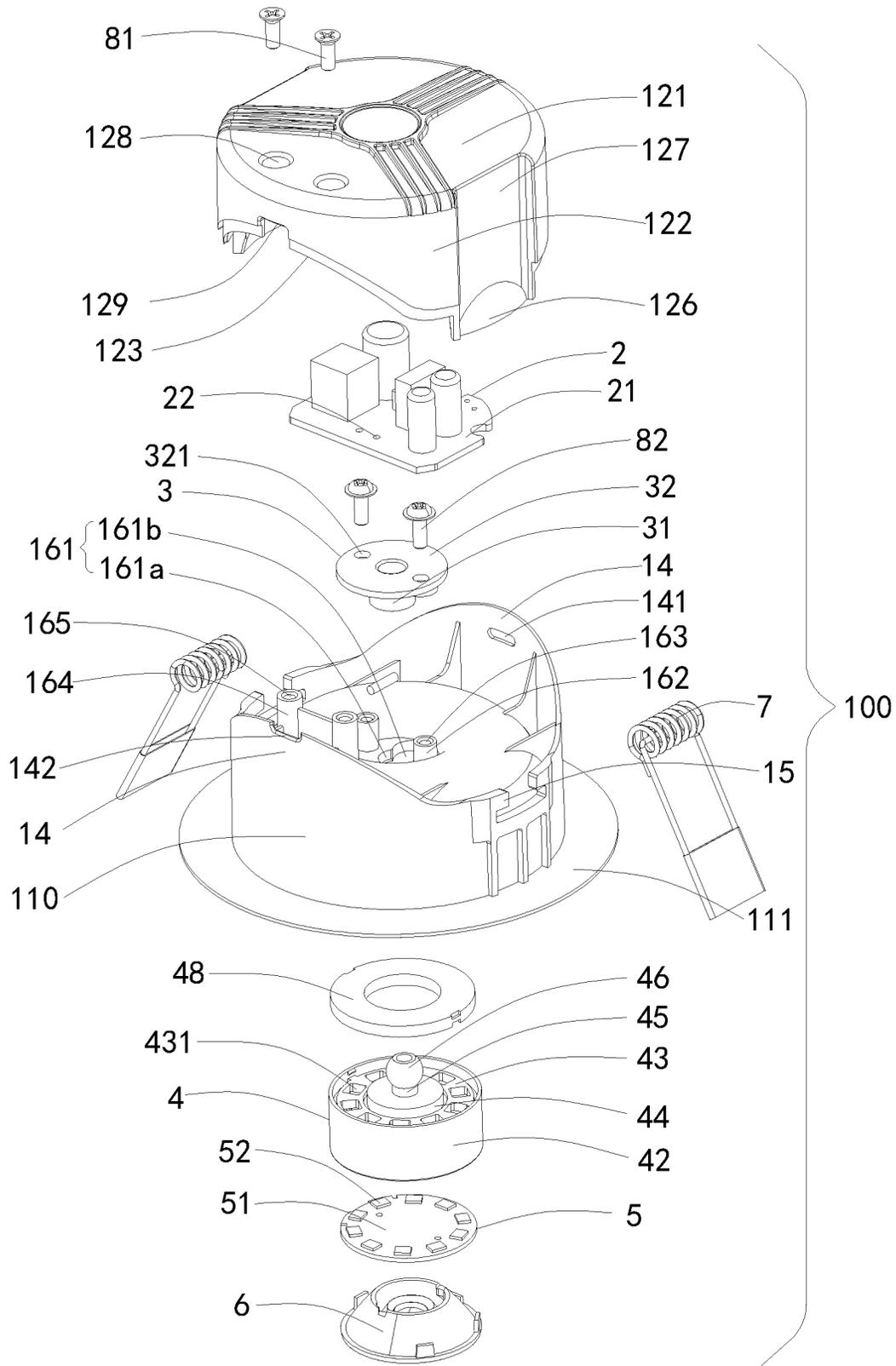


FIG. 5

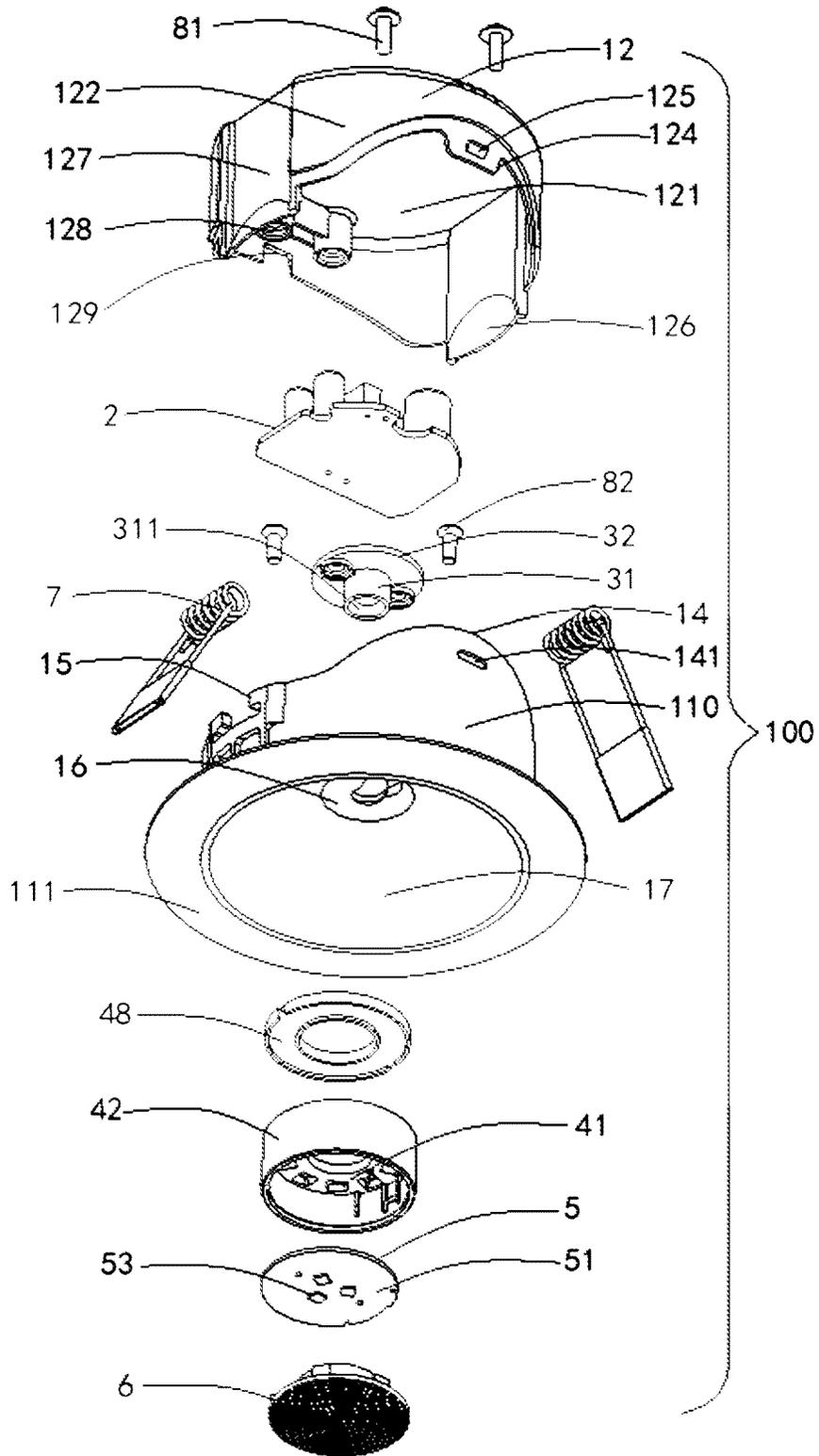


FIG. 6

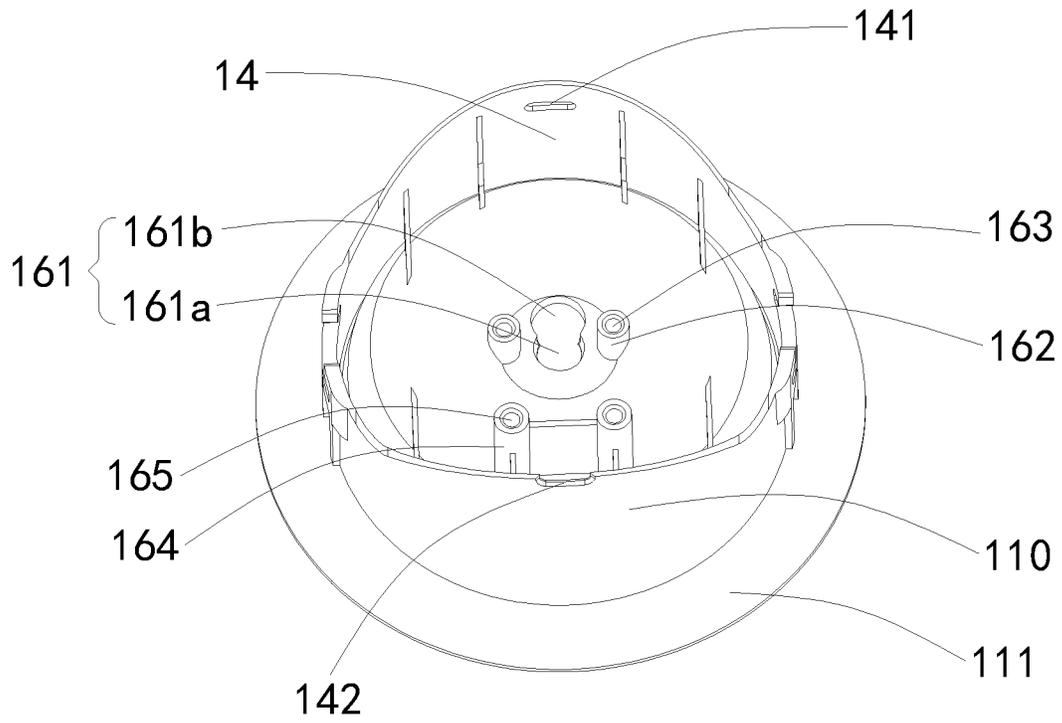


Fig. 7

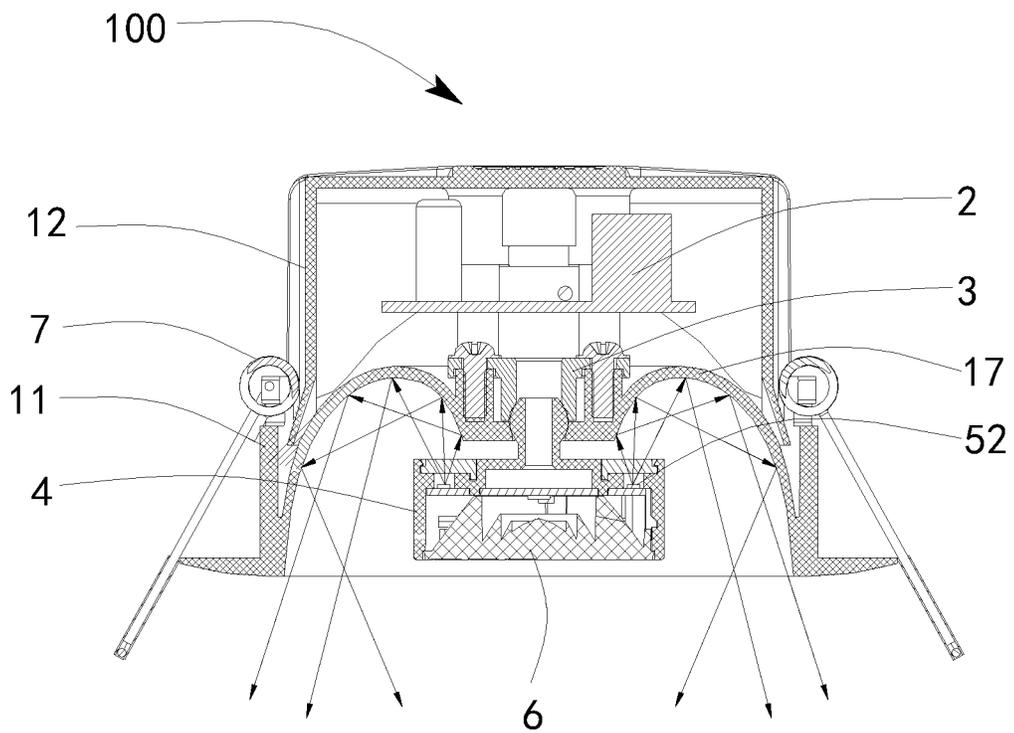


FIG. 8

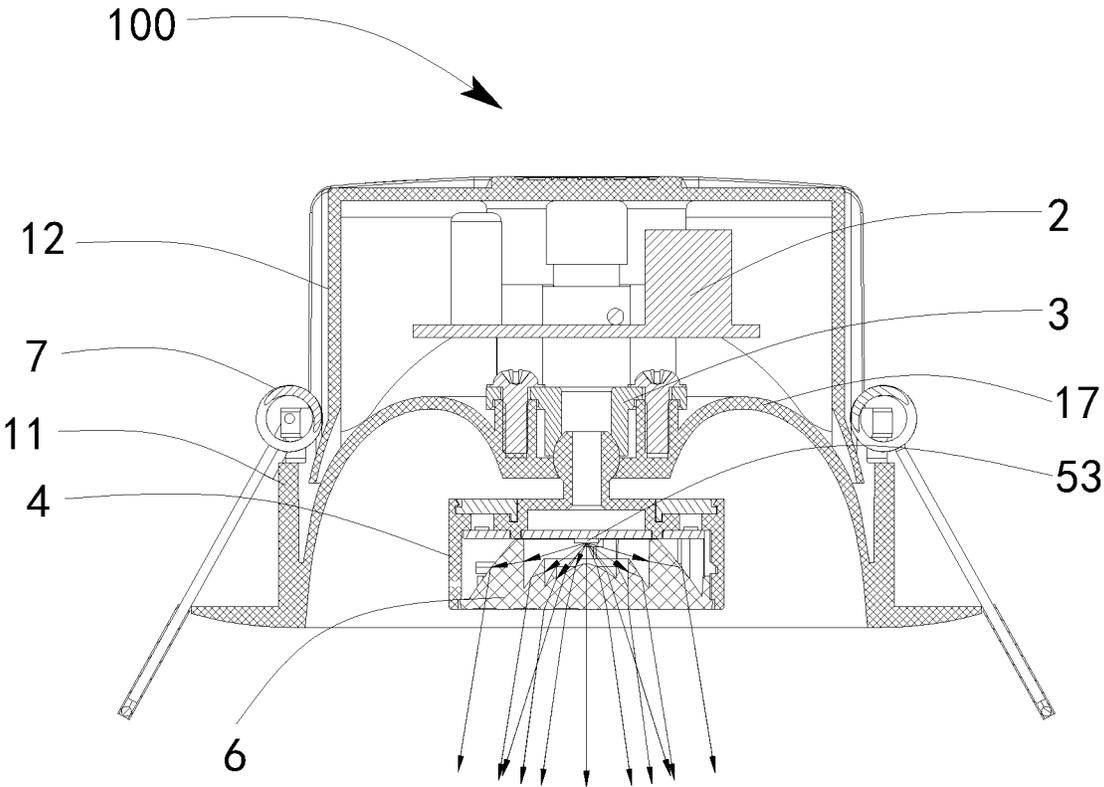


FIG. 9

ILLUMINATION DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the priority of PCT patent application No. PCT/CN2017/105744 filed on Oct. 11, 2017 which claims the priority of Chinese Patent Application No. 201610903815.X filed on Oct. 17, 2016 and Chinese Patent Application No. 201621128845.X filed on Oct. 17, 2016, the entire content of all of which is hereby incorporated by reference herein for all purposes.

TECHNICAL FIELD

The present disclosure relates to the field of illumination technologies, and particularly relates to an illumination device.

BACKGROUND

With the rapid development of semi-illumination technologies, people's demands on illumination devices are higher and higher. Currently, according to an illuminating angle, a ceiling lamp may be a downlight or a spotlight. As an illuminator which is embedded in a ceiling and emits downward light rays, the downlight has the advantage of keeping uniform and perfection architectural ornament, and the artwork in the ceiling may not be affected by the arrangement of lamps. On the other hand, light rays from the spotlight directly illuminate on household objects to be highlighted, so as to emphasize subjective aesthetic sense and achieve art effects of highlighted key points, unique environments, rich layers and atmosphere, and plentiful colors. The spotlight may have soft light rays, and is both dignified and graceful, which not only dominates the whole illumination, but also enables the local lighting and heightens the atmosphere inside the house.

SUMMARY

The present disclosures provides an illumination device and a method of manufacturing an illumination device.

According to a first aspect, the present disclosure provides an illumination device. The illumination device may include: a first lamp body; a driving power supply component received in the first lamp body; a second lamp body connected with the first lamp body; and a light source component received in the second lamp body, where the light source component may include a light source substrate as well as a plurality of first light-emitting units and a plurality of second light-emitting units disposed on two surfaces of the light source substrate.

The illumination device may also include an interior of the first lamp body that is provided with a reflector, where the reflector is configured to reflect light emitted from the plurality of first light-emitting units such that the light emitted from the plurality of first light-emitting units is reflected by the reflector and exits the illumination device.

The illumination device may include an interior of the second lamp body that is provided with a lens, where the lens presses against the light source component and is configured to perform a light condensation and a light collimation to light emitted from the plurality of second light-emitting units such that the light emitted from the plurality of second light-emitting units passes through the lens and exits the illumination device.

According to a second aspect, a method of manufacturing an illumination device is provided. The method may include providing a first lamp body; providing a driving power supply component received in the first lamp body; providing a second lamp body connected with the first lamp body; providing a light source component received in the second lamp body, where the light source component may include a light source substrate as well as a plurality of first light-emitting units and a plurality of second light-emitting units disposed on two surfaces of the light source substrate.

The method may also include providing a reflector for an interior of the first lamp body, where the reflector is configured to reflect light emitted from the plurality of first light-emitting units such that the light emitted from the plurality of first light-emitting units is reflected by the reflector and exits the illumination device.

The method may further include providing a lens for an interior of the second lamp body, where the lens presses against the light source component and is configured to perform a light condensation and a light collimation to light emitted from the plurality of second light-emitting units such that the light emitted from the plurality of second light-emitting units passes through the lens and exits the illumination device.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to clearly illustrate the technical solution of the examples of the disclosure or the technical solution of conventional technologies, the drawings of the examples or the drawings of the conventional technologies will be briefly described in the following; it is obvious that the described drawings are only related to some examples of the disclosure. For those skilled in the art, other drawings can be obtained according to these drawings, without any inventive work

FIG. 1 is a schematic view of an illumination device provided by the present disclosure;

FIG. 2 is a schematic view in another direction of the illumination device provided by the present disclosure;

FIG. 3 is a sectional view taken along an A-A direction in FIG. 2;

FIG. 4 is a schematic view illustrating a state where a second lamp body and a light source component in FIG. 3 are removed;

FIG. 5 is an exploded view in one direction of the illumination device provided by the present disclosure;

FIG. 6 is an exploded view in another direction of the illumination device provided by the present disclosure;

FIG. 7 is a schematic view of a first cover of the illumination device provided by the present disclosure;

FIG. 8 illustrates an optical path in a light-emitting state of a first light-emitting unit of the illumination device provided by the present disclosure; and

FIG. 9 illustrates an optical path in a light-emitting state of a second light-emitting unit of the illumination device provided by the present disclosure.

DETAILED DESCRIPTION

In order to make objects, technical solutions and advantages of the disclosure apparent, the technical solutions of the disclosure will be described in a clearly and fully

understandable way in connection with specific examples and related drawings in the following. Apparently, the described examples are just a part but not all of the examples of the disclosure. Based on the described examples herein, those skilled in the art can obtain other example(s), which should be within the scope of the disclosure.

The terminology used in the present disclosure is for the purpose of describing exemplary examples only and is not intended to limit the present disclosure. As used in the present disclosure and the appended claims, the singular forms “a,” “an” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise. It shall also be understood that the terms “or” and “and/or” used herein are intended to signify and include any or all possible combinations of one or more of the associated listed items, unless the context clearly indicates otherwise.

It shall be understood that, although the terms “first,” “second,” “third,” and the like may be used herein to describe various information, the information should not be limited by these terms. These terms are only used to distinguish one category of information from another. For example, without departing from the scope of the present disclosure, first information may be termed as second information; and similarly, second information may also be termed as first information. As used herein, the term “if” may be understood to mean “when” or “upon” or “in response to” depending on the context.

Reference numerals shown in FIG. 1 to FIG. 9 are: illumination device 100, first lamp body 1, first cover 11, main body part 110, edge part 111, second cover 12, circular top wall 121, annular side wall 122, concave part 123, connecting part 124, protrusion 125, inserting part 126, groove 127, third through hole 128, third opening 129, receiving cavity 13, convex part 14, first through hole 141, first opening 142, elongated hole 143, fastener 15, mounting part 16, through hole 161, first hole part 161a, second hole part 161b, first positioning column 162, first screw hole 163, second positioning column 164, second screw hole 165, reflector 17, reflecting surface 171, first arc surface 172, second arc surface 173, driving power supply component 2, power supply substrate 21, sixth through hole 22, connecting element 3, first connecting part 31, spherical hole 311, pressing plate part 32, eighth through hole 321, seventh through hole 33, fixing groove 34, second lamp body 4, receiving groove 40, partition plate 41, lamp-body side wall 42, annular groove 43, fourth through hole 431, boss 44, connecting rod 45, second connecting part 46, fifth through hole 47, protection cover 48, light source component 5, light source substrate 51, first light-emitting unit 52, second light-emitting unit 53, second light distribution element 6, housing 61, clamp spring 7, first screw 81, and second screw 82.

In the event where both downlight and spotlight are required, the process of mounting both of them is complicated and the cost is expensive because a large number of lamp bodies are mounted on a wall or ceiling, which makes it difficult to meet different illumination requirements. An example of the present disclosure provides an illumination device 100 which integrates a function of the downlight with a function of the spotlight. Please refer to FIG. 1 to FIG. 9 for details.

As illustrated in FIG. 1 to FIG. 9, the illumination device 100 includes a first lamp body 1, a driving power supply component 2 received in the first lamp body 1, a connecting element 3 assembled in the first lamp body 1, a second lamp body 4 which is connected with the connecting element 3 and is rotatable with respect to the first lamp body 1, a light

source component 5 received in the second lamp body 4, a second light distribution element 6 which is received in the second lamp body 4 and presses against the light source component 5, and a clamp spring 7 mounted outside the first lamp body 1. The illumination device 100 described above can be an embedded LED downlight, or a spotlight, or a tube spotlight for indoor illumination. It should be noted that, in other alternative examples, the driving power supply component 2 may not be disposed inside the first lamp body 1 of the illumination device 100, but is disposed outside the illumination device 100.

Various components and the connecting relationship between the components in the illumination device 100 provided by the example of the present disclosure will be described below in more details.

As illustrated in FIG. 1 to FIG. 5, the first lamp body 1 includes a first cover 11 and a second cover 12 connected with the first cover 11. Further, the first lamp body 1 is provided with a receiving cavity 13. After the first cover 11 and the second cover 12 are assembled together, the receiving cavity 13 is delimited by both of the first cover 11 and the second cover 12.

As illustrated in FIG. 3 to FIG. 7, the first cover 11 is substantially cylindrical, and can be formed of a plastic material or a metal material. Specifically, the first cover 11 includes: an integrally formed, main body part 110; an edge part 111 which is disposed at a lower end surface of the main body part 110 and has a horizontal annular shape; a first light distribution element 17 which is located at an inner side of the main body part 110 and is connected with the main body part 110; and a mounting part 16 which is located inside the main body part 110 and is surrounded by the first light distribution element 17. In other alternative examples, it's also possible that the edge part 111 and the first light distribution element 17 are integrally formed as the mounting part 16, which is then connected with the main body part 110.

Structures of various parts of the first cover 11 will be particularly described below.

The edge part 111 of the first cover 11 can be directly abutted against an outer surface of a mounting base (not illustrated), when mounting the illumination device 100. Two sides of an upper end surface of the main body part 110 of the first cover 11 are respectively provided with an upwardly extending convex part 14. Specifically, one of the two convex parts 14 is provided with a strip-shaped positioning hole 141, and the other one of the two convex parts 14 is provided with a strip-shaped first opening 142. The main body part 110 of the first cover 11 is provided with two second openings (not illustrated) which are in an inverted T shape and pass through the main body part 110; in this way, the main body part 110 is formed with a fastener 15 for mounting the clamp spring 7.

As illustrated in FIG. 1 to FIG. 4, FIG. 6 and FIG. 7, the first light distribution element 17 is disposed at the inner side of the main body part 110, and has one end connected with an inner surface of the first cover 11 and the other end connected with the mounting part 16. In the present example, the first light distribution element 17 is preferably a reflector. The first light distribution element 17 has a reflecting surface 171 for performing a secondary light distribution on a part of light emitted from the light source unit 5, i.e., reflecting the light. The first light distribution element 17 can be formed of a plastic material having an optical property such as polycarbonate (PC). A surface of the first light distribution element 17 that faces the light source component 5 is coated with a reflective layer to form the

5

reflecting surface 171. The first light distribution element 17 reflects a part of the light emitted from the light source component 5 to be used for flood lighting of the illumination device 100 at a large angle, so that the illumination device 100 functions as a downlight.

As illustrated in FIG. 2, FIG. 3 and FIG. 6, the first light distribution element 17 has an annular shape in a horizontal direction and has a curved-surface shape in a vertical direction. Specifically, the first light distribution element 17, that is, the reflector, has two J-shaped surfaces in a cross section in the vertical direction, including a first arc surface 172 and a second arc surface 173 which are opposite to each other. When the first cover 11, a plurality of first light-emitting units 52 and a plurality of second light-emitting units 53 are projected onto a plane in the horizontal direction, projections of the plurality of first light-emitting units 52 fall within a range of a projection of the first light distribution element 17, and projections of the plurality of second light-emitting units 53 fall within a range of a projection of the mounting part 16.

As illustrated in FIG. 5 to FIG. 7, the mounting part 16 is provided with a through hole 161 which is in a shape of figure-of-8, and the through hole 161 includes a first hole part 161a and a second hole part 161b connected with the first hole part 161a. Specifically, an inner diameter of the second hole part 161b is greater than an inner diameter of the first hole part 161a, the first hole part 161a is a spherical hole and a center line of the first hole part 161a is coincident with a center line of the first cover 11. The mounting part 16 is further provided with two cylindrical first positioning columns 162, and the two first positioning columns 162 are located at two sides of the first hole part 161a, respectively. A first screw hole 163 is disposed in each of the first positioning columns 162. Additionally, the mounting part 16 is further provided with two second positioning columns 164, and a second screw hole 165 is disposed in each of the second positioning columns 164.

As illustrated in FIG. 1 to FIG. 6, the second cover 12 is integrally formed of a plastic material and is substantially cylindrical, and the second cover 12 is connected with an end of the main body part 110 in a clamping manner to form the first lamp body 1. Specifically, the second cover 12 includes a circular top wall 121 and an annular side wall 122 which extends downwards from the circular top wall 121. An end of the annular side wall 122 is provided with two concave parts 123 which are matched with the two convex parts 14, respectively. One of the concave parts 123 is provided with a connecting part 124 extending outwards, the connecting part 124 is provided with an outward protrusion 125 matched with the first through hole 141, and the protrusion 125 is a wedge block. The other one of the two concave parts 123 is provided with a third opening 129 corresponding to the first opening 142. The first opening 142 and the third opening 129 are matched with each other to form an elongated hole 143 through which a power line (not illustrated) can pass.

Referring to FIG. 5 and FIG. 6, a middle portion between the two concave parts 123 extends downwards along an axial direction of the second cover 12 to form an inserting part 126. Two sides of the first lamp body 1 each are provided with a groove 127 along the axial direction of the first lamp body 1, and the groove 127 communicates the interesting part 126 with the annular side wall 122. The first cover 11 and the second cover 12 are fixedly connected together by means of the first through hole 141 matching with the protrusion 125. The circular top wall 121 is provided with two third through holes 128 respectively

6

corresponding to the second screw hole 165, and the second cover 12 and the first cover 11 are locked with each other through the second screws 82 disposed in the third through hole 128 and in the second screw hole 165. In other alternative examples, the first cover 11 and the second cover 12 may be connected with each other by bonding or in a clamping manner, or by other ways, which are not particularly described herein.

As illustrated in FIG. 1 to FIG. 4, two clamp springs 7 can be rotatably sleeved on two fasteners 15, respectively. By means of the clamp springs 7, the illumination device 100 may be mounted on the mounting base. The groove 127 is used for reserving a space for dismounting and rotating the clamp springs 7 conveniently. Of course, in other alternative examples of the present disclosure, the clamp spring 7 may be mounted on a card (not illustrated) in advance, and then the card is mounted onto the second cover 12 or the first cover 11 by bonding or by using a screw. By means of the first cover 11 and the clamp spring 7, the illumination device 100 may be mounted on the mounting base, for example, a building wall or a ceiling or the like.

As illustrated in FIG. 3, FIG. 5 and FIG. 7, the connecting element 3 includes a tubular first connecting part 31 and a pressing plate part 32 which extends from an end of the first connecting part 31 towards a periphery of the first connecting part 31, and the connecting element 3 is locked with the first cover 11 through a first screw 81. A bottom of the first connecting part 31 is provided with a spherical hole 311 corresponding to the first hole part 161a, and the spherical hole 311 is combined with the first hole part 161a to form a fixing groove 34. The pressing plate part 32 is provided with an eighth through hole 321 corresponding to the first screw hole 163. The connecting element 3 is locked on the mounting part 16 by means of the first screw 81 which passes through the eighth through hole 321 and is received in the first screw hole 163.

As illustrated in FIG. 3 to FIG. 5, the second lamp body 4 includes a tubular lamp-body side wall 42 and a partition plate 41 disposed in the lamp-body side wall 42. A position where the first lamp body 1 is connected with the second lamp body 4 is located at a middle part of the first light distribution element 17, i.e., a middle part of the reflector. A bottom of the reflector is located between a bottom of the first lamp body 1 and the position where the first lamp body 1 is connected with the second lamp body 4. Further, a receiving groove 40 is delimited by an inner surface of the lamp-body side wall 42 and a lower surface of the partition plate 41. A boss 44 is provided at a middle part of an upper surface of the partition plate 41, and an annular groove 43 is formed between the boss 44 and the lamp-body side wall 42. The boss 44 is connected, through a connecting rod 45, with a spherical second connecting part 46 which is matched with the fixing groove 34. The second connecting part 46 is rotatable in the fixing groove 34 under an action of an external force, thereby adjusting an angle of the second lamp body 4. In mounting, the second connecting part 46 passes through the second hole part 161b, and then moves from a position where the connecting rod 45 is located to the first hole part 161a, and then the connecting element 3 is locked onto the mounting part 16 by means of the first screws 81.

As illustrated in FIG. 3 to FIG. 5, the partition plate 41 is provided with a plurality of fourth through holes 431. The fourth through hole 431 penetrates the upper surface and the lower surface of the partition plate 41, and is communicated with the annular groove 43 so as to allow light to pass there-through. The second lamp body 4 is provided with a fifth through hole 47, the fifth through hole 47 penetrates the

partition plate **41**, the boss **44**, the connecting rod **45** and the second connecting part **46** so as to allow a conductive wire to pass there-through. The second lamp body **4** is a plastic lamp body, and may be formed by a single injection molding process, which achieves convenient production and low costs. Of course, in order to enhance the heat dissipation effect of the illumination device **100**, the second lamp body **4** may alternatively be formed of a thermal conductive metal material such as aluminum.

The annular groove **43** is provided with a protective cover **48** which is formed of a transparent insulation material, so as to allow the light emitted from the light source component **5** to pass there-through. The transparent insulation material may be an insulation material such as PMMA (polymethyl methacrylate), polycarbonate (PC), polystyrene (PS), polyester resin (PET) and polyethylene terephthalate glycol (PETG). The arrangement of the protective cover **48** allows a distance between the light source component **5** and the driving power supply component **2** to meet regulations related to a safe creep distance.

As illustrated in FIG. **8** and FIG. **9**, the light source component **5** is received in the receiving groove **40**, and the light source component **5** includes a light source substrate **51**, a plurality of first light-emitting units **52** disposed on a surface of the light source substrate **51**, and a plurality of second light-emitting units **53** disposed on the other surface of the light source substrate **51**. The plurality of second light-emitting units **53** may emit light towards an opening of the second lamp body **4**, and the plurality of first light-emitting units **52** may emit light in a direction opposite to the direction of the light emitted from the second light-emitting units **53**.

Preferably, the plurality of first light-emitting units **52** and the plurality of second light-emitting units **53** are LED light sources. The plurality of first light-emitting units **52** and the second light-emitting units **53** may be electrically connected onto the light source substrate **51** by using through hole technology (THT) or surface mount technology (SMT). The light source substrate **51** may be a printed circuit board, and the printed circuit board is attached with conducting circuits (not illustrated). With the above-mentioned conducting circuits, the plurality of first light-emitting units **52** may be electrically connected, the plurality of second light-emitting units **53** may be electrically connected, or the plurality of first light-emitting units **52** and the plurality of second light-emitting units **53** may be electrically connected.

As illustrated in FIG. **3** and FIG. **5** to FIG. **9**, particularly, the plurality of first light-emitting units **53** are arranged in a circumferential direction of the light source substrate **51** and are disposed in one-to-one correspondence with the plurality of fourth through holes **431**. In this way, the light emitted from the plurality of first light-emitting units **53** may pass through the corresponding fourth through holes **431** respectively, and then illuminates onto the reflecting surface **171** of the reflector **17**, and then exits after being reflected by the reflector **17**. The second light-emitting units **52** are located in a central area of the light source substrate **51**. The second light distribution element **6** is located in the receiving groove **40**, and the second light distribution element **6** is configured to adjust an optical path of the light emitted from the second light-emitting units **53**, i.e., light distribution, such as light condensation and light diffusion. In the present disclosure, preferably, a condensation and collimation lens is used as the second light distribution element **6**. In a situation where the second light-emitting units **53** emit light, the second light distribution element **6** has a function of light condensation

so as to be used for small-angle accent lighting. In this way, the illumination device **100** functions as the spotlight.

As illustrated in FIG. **3** to FIG. **6**, the driving power supply component **2** is received in the receiving cavity **13**, and includes a power supply substrate **21** and an LED driving power supply (not illustrated) disposed at a side of the power supply substrate **21**. The plurality of first light-emitting units **52** and the plurality of light-emitting units **53** as well as the driving power supply component **2** are located at two sides of the first light distribution element **17** respectively. The LED driving power supply is connected with the light source substrate **51** through a conductive wire (not illustrated). The power supply substrate **21** is further provided with a controller (not illustrated), and the controller includes a timer, a switch (not illustrated) for controlling the first light-emitting unit **52** and the second light-emitting unit **53** respectively, and a signal receiver for receiving a signal from a remote controller or a control terminal. Specifically, after the signal receiver receives the signal, the controller controls the first light-emitting unit **52** or the second light-emitting unit **53** to turn on or turn off, or controls the first light-emitting unit **52** and the second light-emitting unit **53** to be switched; moreover, the first light-emitting unit **52** and the second light-emitting unit **53** may also be switched periodically by using the timer.

The LED driving power supply includes a plurality of components and elements, including but not limited to an LED driving controller chip, a rectification chip, a resistor, a capacitor, a fuse wire, a coil, or the like. The power supply substrate **21** is further provided with a plurality of sixth through holes **22**, through which screws can pass so as to fix the power supply substrate **21** onto the second cover **12** or the first cover **11**. The number of the sixth through holes **22** is at least two. The at least two sixth through holes **22** may be located at an edge of the power supply substrate **21**, for avoiding interference with components and elements on the power supply substrate **21**.

Compared with other designs, in the illumination device provided by the present disclosure, the first light-emitting units are used for wide-angle floodlighting so that the illumination device can serve as a downlight, while the second light-emitting units are used for small-angle accent lighting so that the illumination device can serve as a spotlight. The illumination device provided by the present disclosure integrates the downlight with the spotlight, which allows for a simpler structure and a convenient usage. In mounting and using, the angle of the second lamp body may be adjusted according to illumination requirements, which is convenient.

The present disclosure provides an illumination device at low cost which may achieve different illumination effects.

The present disclosure provides an illumination device, including: a first lamp body; a driving power supply component received in the first lamp body; a second lamp body connected with the first lamp body; and a light source component received in the second lamp body; the light source component includes a light source substrate as well as a plurality of first light-emitting units and a plurality of second light-emitting units disposed on two surfaces of the light source substrate respectively; an interior of the first lamp body is provided with a reflector, the reflector is configured to reflect light emitted from the plurality of first light-emitting units such that the light emitted from the plurality of first light-emitting units is reflected by the reflector and then exits the illumination device; an interior of the second lamp body is provided with a lens, the lens presses against the light source component and is configured

to perform a light condensation and a light collimation to light emitted from the plurality of second light-emitting units such that the light emitted from the plurality of second light-emitting units passes through the lens and then exits the illumination device.

Further, the first lamp body includes a first cover and a second cover connected with the first cover; the first cover and the second cover delimit a receiving cavity; and the driving power supply component is located in the receiving cavity.

Further, the first cover includes: a main body part; an edge part which is disposed at a lower end surface of the main body part and has a horizontal annular shape; and a mounting part located in the main body part, the reflector is disposed at an inner side of the main body part, one end of the reflector is connected with an inner surface of the first cover, and the other end of the reflector is connected with the mounting part.

Further, a cross section of the reflector along a vertical direction includes two J-shaped surfaces.

Further, when the first cover, the plurality of first light-emitting units and the plurality of second light-emitting units are projected onto a plane in a horizontal direction, projections of the plurality of first light-emitting units fall within a range of a projection of the reflector, and projections of the plurality of second light-emitting units fall within a range of a projection of the mounting part.

Further, the plurality of first light-emitting units and the plurality of second light-emitting units are located at one side of the reflector, and the driving power supply component is located at the other side of the reflector.

Further, the reflector is integrally formed with the edge part.

Further, the reflector is integrally formed with the main body part, the edge part and the mounting part.

Further, the illumination device further includes a connecting element configured to connect the first lamp body with the second lamp body; one end of the connecting element is connected with the first lamp body, and the other end of the connecting element is connected with the second lamp body; and the second lamp body includes a connecting part connected with the connecting element.

Further, the second lamp body further includes a lamp-body side wall and a partition plate located in the lamp-body side wall; a receiving groove is delimited by an inner surface of the lamp-body side wall and a lower surface of the partition plate; and the light source component and the lens are located in the receiving groove.

Further, the second lamp body is provided with a boss, the boss is located on an upper surface of the partition plate and is connected with the connecting part; an annular groove is formed between the boss and the lamp-body side wall; and a protective cover formed of a transparent insulation material is disposed in the groove.

Further, the partition plate is provided with a plurality of through holes, the plurality of through holes penetrate the upper surface and the lower surface of the partition plate and are communicated with the groove; and the plurality of first light-emitting units are disposed in one-to-one correspondence with the plurality of through holes.

Further, the driving power supply component includes a power supply substrate, and the power supply substrate is electrically connected with the light source substrate.

Further, the power supply substrate is further provided with a controller, and the controller is configured to control an on-off of at least one of the plurality of first light-emitting

units and the plurality of second light-emitting units, and to receive a signal from a remote controller or a signal from a control terminal.

Further, the controller is configured to control the on-off of the plurality of first light-emitting units and the plurality of second light-emitting units at a predetermined frequency.

Compared with other designs, in the illumination device of the present disclosure, light emitted from a plurality of first light-emitting units is subjected to a light distribution of a first light distribution element and then exits, light emitted from a plurality of second light-emitting units is subjected to a light distribution of a second light distribution element and then exits; by integrating the first light-emitting units with the second light-emitting units, it can achieve different illumination effects with simpler structure, convenient usage and low cost.

The present disclosure provides a method of manufacturing an illumination device. The method may include: providing a first lamp body; providing a driving power supply component received in the first lamp body; providing a second lamp body connected with the first lamp body; providing a light source component received in the second lamp body, where the light source component comprises a light source substrate as well as a plurality of first light-emitting units and a plurality of second light-emitting units disposed on two surfaces of the light source substrate.

The method may also include providing a reflector for an interior of the first lamp body, where the reflector is configured to reflect light emitted from the plurality of first light-emitting units such that the light emitted from the plurality of first light-emitting units is reflected by the reflector and exits the illumination device.

The method may include providing a lens for an interior of the second lamp body, where the lens presses against the light source component and is configured to perform a light condensation and a light collimation to light emitted from the plurality of second light-emitting units such that the light emitted from the plurality of second light-emitting units passes through the lens and exits the illumination device.

Additionally, the method may include connecting a first cover of the first lamp body with a second cover of the first lamp body, and delimiting a receiving cavity by using the first cover and the second cover, where the driving power supply component is located in the receiving cavity.

The method may include providing a main body part of the first cover, an edge part of the first cover, and a mounting part of the first cover, where the edge is disposed at a lower end surface of the main body part and has a horizontal annular shape, and the mounting part is located in the main body part; and disposing the reflector at an inner side of the main body part, wherein one end of the reflector is connected with an inner surface of the first cover, and another end of the reflector is connected with the mounting part.

In the method, a cross section of the reflector along a vertical direction may include two J-shaped surfaces.

The method may include projecting the first cover, the plurality of first light-emitting units and the plurality of second light-emitting units onto a plane in a horizontal direction, where projections of the plurality of first light-emitting units fall within a range of a projection of the reflector, and projections of the plurality of second light-emitting units fall within a range of a projection of the mounting part.

The present disclosure may include dedicated hardware implementations such as application specific integrated circuits, programmable logic arrays and other hardware devices. The hardware implementations can be constructed

11

to implement one or more of the methods described herein. Applications that may include the apparatus and systems of various examples can broadly include a variety of electronic and computing systems. One or more examples described herein may implement functions using two or more specific interconnected hardware modules or devices with related control and data signals that can be communicated between and through the modules, or as portions of an application-specific integrated circuit. Accordingly, the system disclosed may encompass software, firmware, and hardware implementations. The terms “module,” “sub-module,” “circuit,” “sub-circuit,” “circuitry,” “sub-circuitry,” “unit,” or “sub-unit” may include memory (shared, dedicated, or group) that stores code or instructions that can be executed by one or more processors. The module refers herein may include one or more circuit with or without stored code or instructions. The module or circuit may include one or more components that are connected.

The objects, technical solutions and beneficial effects of the present disclosure have been further explained particularly in the examples above. It should be appreciated that, what are described above are merely specific examples of the present disclosure but are not limitative to the present disclosure. Any modifications, equivalents and variations within the spirit and principle of the present disclosure shall fall within the protection scope of the present disclosure.

What is claimed is:

1. An illumination device, comprising:

a first lamp body;

a driving power supply component received in the first lamp body;

a second lamp body connected with the first lamp body;

a connecting element configured to connect the first lamp body with the second lamp body, wherein one end of the connecting element is connected with the first lamp body, another end of the connecting element is connected with the second lamp body, and the second lamp body comprises a connecting part connected with the connecting element; and

a light source component received in the second lamp body, the light source component comprising a light source substrate, a plurality of first light-emitting units and a plurality of second light-emitting units disposed on two surfaces of the light source substrate, wherein: an interior of the first lamp body is provided with a reflector, the reflector is configured to reflect light emitted from the plurality of first light-emitting units such that the light emitted from the plurality of first light-emitting units is reflected by the reflector and exits the illumination device,

an interior of the second lamp body is provided with a lens, the lens presses against the light source component and is configured to perform a light condensation and a light collimation to light emitted from the plurality of second light-emitting units such that the light emitted from the plurality of second light-emitting units passes through the lens and exits the illumination device,

the second lamp body further comprises a lamp-body side wall and a partition plate located in the lamp-body side wall,

a receiving groove is delimited by an inner surface of the lamp-body side wall and a lower surface of the partition plate,

the light source component and the lens are located in the receiving groove,

12

the second lamp body is provided with a boss, the boss is located on an upper surface of the partition plate and is connected with the connecting part,

an annular groove is formed between the boss and the lamp-body side wall, and a protective cover formed of a transparent insulation material is disposed in the annular groove,

the partition plate is provided with a plurality of through holes, the plurality of through holes penetrate the upper surface and the lower surface of the partition plate and are communicated with the annular groove, and

the plurality of first light-emitting units are disposed in one-to-one correspondence with the plurality of through holes.

2. The illumination device according to claim 1, wherein: the first lamp body comprises a first cover and a second cover, wherein the second cover is connected with the first cover, and

the first cover and the second cover delimit a receiving cavity, and the driving power supply component is located in the receiving cavity.

3. The illumination device according to claim 2, wherein: the first cover comprises: a main body part, an edge part which is disposed at a lower end surface of the main body part and has a horizontal annular shape, and a mounting part located in the main body part; and

the reflector is disposed at an inner side of the main body part, one end of the reflector is connected with an inner surface of the first cover, and another end of the reflector is connected with the mounting part.

4. The illumination device according to claim 3, wherein, when the first cover, the plurality of first light-emitting units and the plurality of second light-emitting units are projected onto a plane in a horizontal direction, projections of the plurality of first light-emitting units fall within a range of a projection of the reflector, and projections of the plurality of second light-emitting units fall within a range of a projection of the mounting part.

5. The illumination device according to claim 3, wherein the reflector is integrally formed with the edge part.

6. The illumination device according to claim 3, wherein the reflector is integrally formed with the main body part, the edge part and the mounting part.

7. The illumination device according to claim 1, wherein the driving power supply component comprises a power supply substrate, and the power supply substrate is electrically connected with the light source substrate.

8. The illumination device according to claim 7, wherein the power supply substrate is further provided with a controller, and the controller is configured to control an on-off of at least one of the plurality of first light-emitting units and the plurality of second light-emitting units, and to receive a signal from a remote controller or a signal from a control terminal.

9. The illumination device according to claim 8, wherein the controller is configured to control the on-off of the plurality of first light-emitting units and the plurality of second light-emitting units at a predetermined frequency.

10. The illumination device according to claim 1, wherein a cross section of the reflector along a vertical direction comprises two J-shaped surfaces.

11. The illumination device according to claim 1, wherein the plurality of first light-emitting units and the plurality of second light-emitting units are located at one side of the reflector, and the driving power supply component is located at another side of the reflector.

13

12. A method of manufacturing an illumination device, comprising:
 providing a first lamp body;
 providing a driving power supply component received in the first lamp body;
 providing a second lamp body connected with the first lamp body;
 providing a connecting element configured to connect the first lamp body with the second lamp body, wherein one end of the connecting element is connected with the first lamp body, and another end of the connecting element is connected with the second lamp body, and the second lamp body comprises a connecting part connected with the connecting element;
 providing a light source component received in the second lamp body, wherein the light source component comprises a light source substrate, a plurality of first light-emitting units and a plurality of second light-emitting units disposed on two surfaces of the light source substrate;
 providing a reflector for an interior of the first lamp body, wherein the reflector is configured to reflect light emitted from the plurality of first light-emitting units such that the light emitted from the plurality of first light-emitting units is reflected by the reflector and exits the illumination device;
 providing a lens for an interior of the second lamp body, wherein the lens presses against the light source component and is configured to perform a light condensation and a light collimation to light emitted from the plurality of second light-emitting units such that the light emitted from the plurality of second light-emitting units passes through the lens and exits the illumination device;
 providing a lamp-body side wall disposed on the second lamp body and a partition plate located in the lamp-body side wall, wherein a receiving groove is delimited by an inner surface of the lamp-body side wall and a lower surface of the partition plate, and the light source component and the lens are located in the receiving groove,
 providing a boss disposed on the second lamp body, wherein the boss is located on an upper surface of the partition plate and is connected with the connecting part, and an annular groove is formed between the boss and the lamp-body side wall;

14

providing a protective cover formed of a transparent insulation material, wherein the protective cover is disposed in the annular groove;
 providing the partition plate with a plurality of through holes, wherein the plurality of through holes penetrate the upper surface and the lower surface of the partition plate and are communicated with the annular groove; and
 disposing the plurality of first light-emitting units in one-to-one correspondence with the plurality of through holes.
 13. The method according to claim 12, further comprising:
 connecting a first cover of the first lamp body with a second cover of the first lamp body, and
 delimiting a receiving cavity by using the first cover and the second cover, wherein the driving power supply component is located in the receiving cavity.
 14. The method according to claim 13, further comprising:
 providing a main body part of the first cover, an edge part of the first cover, and a mounting part of the first cover, wherein the edge is disposed at a lower end surface of the main body part and has a horizontal annular shape, and the mounting part is located in the main body part; and
 disposing the reflector at an inner side of the main body part, wherein one end of the reflector is connected with an inner surface of the first cover, and another end of the reflector is connected with the mounting part.
 15. The method according to claim 14, further comprising:
 projecting the first cover, the plurality of first light-emitting units and the plurality of second light-emitting units onto a plane in a horizontal direction, wherein projections of the plurality of first light-emitting units fall within a range of a projection of the reflector, and projections of the plurality of second light-emitting units fall within a range of a projection of the mounting part.
 16. The method according to claim 12, wherein a cross section of the reflector along a vertical direction comprises two J-shaped surfaces.

* * * * *